SALMONID ENHANCEMENT PROGRAM

1989 - 1990 UPDATE

Fisheries and Oceans Pêches et Océans

BC MINISTRY OF ENVIRONMENT

Canada

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Department Fisheries and Oceans

Salmonid Enhancement Program

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Canada

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SEP EXPENDITURES BY PROGRAM

(in thousands of dollars)

PROGRAM AREA	*1988/89*	*1989/90*
Enhancement Operations & Maintenance	17,928	19,062
New and Expanded Production (construction)	3,684	3,206
Pilot Studies	426	–
Community Involvement	6,161	7,067
Resource Restoration (minor production)	2,187	2,230
Program Planning, Support & Direction	827	845
Pacific Salmon Foundation	150	55
Lake Enrichment	1,665	1,802
Manageability/Mark Recovery/ Tag Program	879	614
Reconnaissance & Feasibility	358	296
Canada/U.S. Operations & Maintenance	2,316	1,922
Evaluation/Planning	500	898
Research/Science Related Studies	2,457	2,294
Provincial Program (provincial share)	1,470	1,470
TOTAL PROGRAM	41,008	41,761
SOURCES OF FUNDS		
Fisheries & Oceans – Federal	31,338	31,491
Western Economic Diversification – Federal	8,200	8,800
Province of B.C. – Provincial	1,470	1,470
TOTAL SOURCES	41,008	41,761

Notes. 1) Contribution Employees' Benefit Package is not included in 88/89 and 89/90 expenditures. This is approximately 15 % of total salary cost. In 1988/89 the contribution by the Federal Government was approximately 1.7 million which brought the contribution by the Federal Government to 41.2 million. In 1989/90 the benefit package was approximately 1.8 million which brought the contribution by the Federal Government to 42.1 million. 2) The funding from Western Economic Diversification is 53.7 million over five years from 1987/88 to 1991/92.

DIRECTOR'S REPORT

Many events had an impact on SEP in fiscal 1989-90. Some we anticipated. Others, most notably the raging floods of November, we did not.

Among the highlights of the year were the first year of operation for the sockeye channel at Horsefly, fully loaded with 23,000 spawners, and loading of the pink channel at Glendale, with 46,000. A bright spot in the chinook picture was seen at Kitimat, where 1989 saw a return of 30 to 40 thousand adults and a sport catch of about 11,000. The largest of the hatchery-marked chinook weighed an impressive 72 pounds!

The year also saw full implementation of the new administrative structure for Community Involvement and expansion of the Community Advisors group. Although there were initial difficulties with increased work loads for Community Advisors in some regions, the amalgamation of Public Involvement (PIP) and Community Economic Development (CEDP) was generally successful. There have been direct benefits through increased co-operation between PIP and CEDP projects in many parts of British Columbia. Additional support at Regional Headquarters should soon be in place to assist Community Advisors with the paper burden.

The new Community Ventures program, instituted in the past year, shows promise. It permitted expanded operation of some volunteer-based projects in 1989-90 and concentrated on stocks that are of particular importance to fisheries managers. Time prevented awarding of all the funds available, but 1990-91 should see the program in full operation. This will be valuable in situations where volunteers are unable to find the hours needed to operate a project at full capacity.

SEP was looking to the future last year with a greater emphasis on research. We identified several key questions for SEP and squeezed the existing budget to undertake a joint program with the Biological Sciences Branch. Three main areas; early marine survivals, disease in hatcheries and genetic studies, will be addressed. All are of considerable scientific interest and each has a particular impact on enhancement operations. We have observed declining survivals, particularly of chinook, in recent years and hope that a more thorough examination of marine survival factors may help SEP to overcome the problem. Studies in Barkley Sound and Georgia Strait are an important part of this effort. The issues surrounding disease outbreaks in hatcheries are clearly of great importance to SEP. In one case when the disease agent is unknown, losses have been up to 40 percent of the juveniles. A better understanding of fish disease causes may lead to more effective prevention and treatment – a benefit to both major facilities and community projects. The final area of investigation, salmon genetics, will aim to provide hard facts for the ongoing debate about what, if any, differences exist between wild and hatchery fish and whether there is cause for concern.

While SEP initiated these steps forward, it also continued its planned activities, completing the expansions at Nitinat and Tenderfoot, building spawning channels on the Horsefly and Kakweikan Rivers, constructing a new low-level fishway at Hells Gate and

completing several small enhancement and habitat restoration projects.

The past year also produced surprises. Although Nature is frequently unpredictable, SEP projects were particularly hard-hit late in 1989. Floods caused serious damage to two northern spawning channels; the Owikeno (Oweekeno) and Shotbolt community operations on the Central Coast; and to the Chilliwack and Chehalis hatcheries on the lower Fraser River. Although the newly-completed Kakweikan spawning channel was not damaged, its intake was left high and dry.

The floods did produce some positive results from SEP activities. The Horsefly spawning channel on the Fraser system, in its first year of operation, was loaded with 23,000 of the 1.2 million spawning sockeye. Following the flood, survivals were only about four percent in the river, although 85 percent of the fry in the channel survived. Without the channel, the disaster for the Horsefly sockeye run would have been overwhelming.

All of the natural disasters required heroic efforts from staff, contractors and volunteers to save eggs and alevins. Their response was outstanding and kept lost production to a minimum. Once the initial salvage operations and mop-ups were over, the damage was assessed. The cost for repairs has been, and will be, substantial.

Funding continues to be an area of concern for SEP management. Although the five-year funding program announced in 1987, which included $53.7 million from Western Economic Diversification, served to stabilize SEP's economic base, we are limited in pursuit of new enhancement objectives by lack of extra funds. For this reason, opportunities for joint ventures involving industrial partners will be sought where appropriate. This approach has worked well in the past for several of the volunteer projects within SEP and may be applicable in other areas of the program. Other funding solutions will be explored also.

With all the upsets, surprises and gratifying successes, SEP continues to be one of the most challenging and rewarding programs to work in.

David Griggs
Director, SEP

DUTEAU CREEK – CATTLE FENCE FOR FISH

The problem is as old as ranching in the B.C. interior. Cattle need water, so the practise has been to let them wander into the nearest creek and get some. Unfortunately, cattle are not concerned with neatness. While slaking their thirst, they may trample spawning beds, break down stream banks and stir up silt that smothers incubating eggs. They also love to graze on the tender shoots that would otherwise develop into new streamside vegetation.

Various parts of the community – farmers, a local fish and game club – got together with Fisheries and Oceans staff to solve that old problem in the Okanagan last year. The solution was simple; they built a fence. Deciding where a fence would be useful was a bit more complex; not every creek will benefit from such treatment:

"We felt comfortable trying this on Duteau Creek," says SEP Biologist Mel Sheng, "It is a fairly small, high-profile stream – one of the major coho streams in the area – and it has a pretty stable water flow. Cattle are the major cause of bank destabilization there; we know that if we keep them out, the stream can recover from flood events on its own."

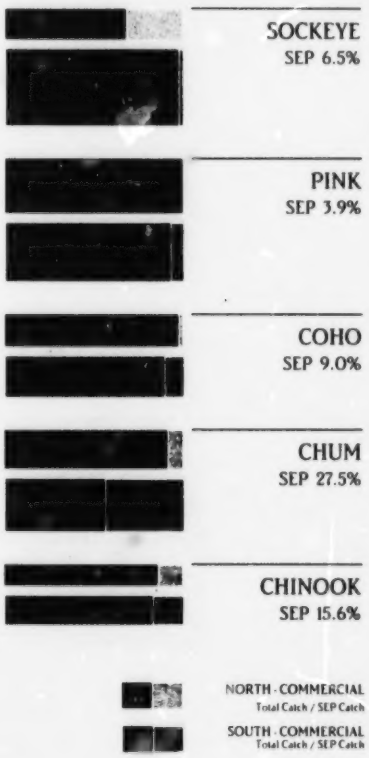
Duteau Creek, part of the Fraser-Shuswap drainage system, is located near the town of Lumby. Along with coho and chinook salmon, it hosts rainbow trout (both resident and Mable Lake spawners). It is a creek that will easily repay the enhancement effort undertaken.

The project required the co-operation of Fisheries and Oceans (for design and materials) and Employment and Immigration (for manpower funding) as well as the landowners along the stream banks. Much of the drive came from Oceola Fish and Game Club members and a Salmon Arm federal Fishery Officer, Byril Kurtz. It was the club which obtained the job creation funding that got the job done.

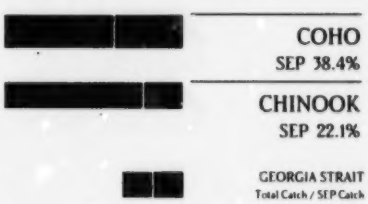
Some of the early work involved convincing farmers that the design could keep cattle away from most of the banks, while still providing adequate crossings and waterhole access. At crossings and watering sites, the stream has been lined with rock and gravel to minimize silting. Elsewhere, the five-strand barbed wire fence keeps cattle far enough off the banks to let growth become established. By spring, 1990, results were already starting to show: "The banks look really good after the spring run-off," says Sheng, "The only problems we had were with debris building up on the crossing fences, so we will have to alter the design and rebuild those. Everything else is looking good."

"The cattle are doing fine, no problems at all" says local land owner Dan Colvin.

SEP CONTRIBUTION TO 1989
COMMERCIAL CATCHES

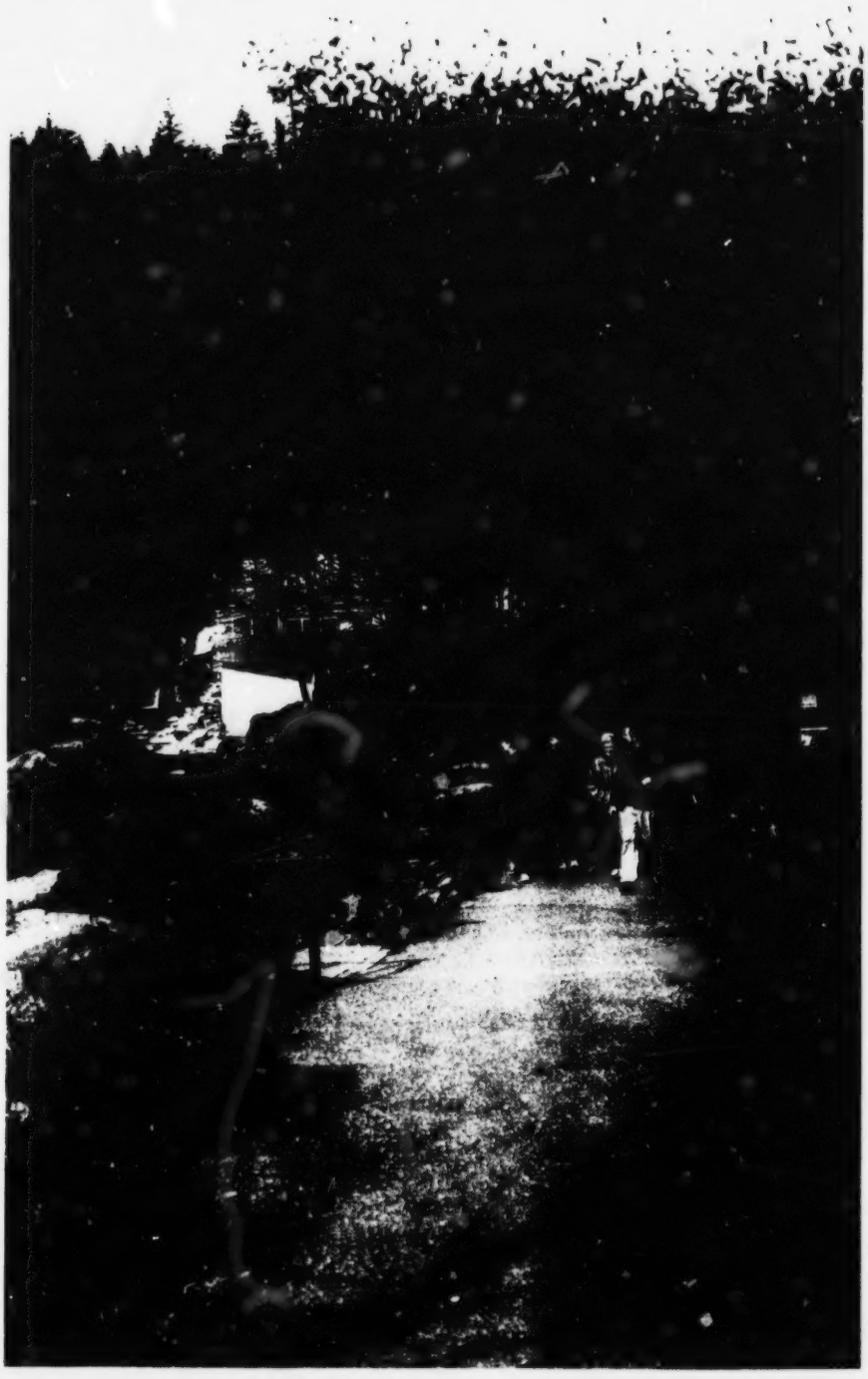


GEORGIA STRAIT SPORT CATCHES



"I think it's a wonderful project," says B.C. Ministry of Environment's Gordon MacKinnon, "Everyone here is pleased with it."

As the trees begin to grow along the streambank, Sheng hopes SEP can thin the cottonwoods and encourage willows, which are less prone to falling at maturity and diverting streams. Now that the fence is keeping the cattle in their place, it would be good to promote vegetation that would keep the creek from wandering on to the farmer's fields.

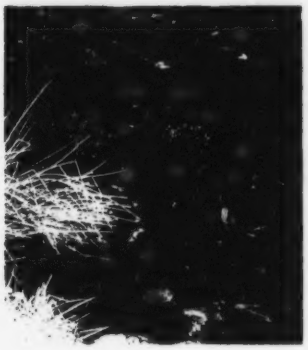


SEP is for fish, but it's also for people. SEP hatcheries, like this one on the Capilano River in North Vancouver, serve a dual Purpose. They produce millions of juvenile salmonids each year and they let the public learn more about this valuable resource.

NO ROOM ON LAND? MOVE OUT TO SEA.

Buntzen Bay, on Indian Arm, displays classic West Coast geography; a creek, a narrow strip of foreshore and steep hills rising sharply behind. Such shorelines offer abundant fresh water from their creeks and a rich marine environment just off shore, but they provide little space on land for incubating and rearing young fish. For years, many such sites have been tempting, but impractical, for enhancement projects. SEP put a new technology to work at Buntzen Bay last year that may change all that.

For some years, it has been common practise to put salmon smolts into seapens for a short time before release. At Buntzen last year, swimup chinook fry were introduced directly into the seapen. Initially, the pen was surrounded with a plastic skirt and water from the nearby creek was piped into it. This provided a freshwater lens – and a comfortable environment for the young fry. As they developed, the fry were free to seek their own level of salinity by moving up or down within the pen. When



freshwater runoff slowed, later in the spring, the skirt was removed and the salinity level began to rise. The fish adapted even better than expected and maintained excellent growth rates.

For the Buntzen Bay volunteer project, this technique offered the chance to greatly increase production from a site that offered very little on-shore rearing space. As well, it allowed the project to participate in SEP's increased effort to produce strong chinook runs into Georgia Strait and Indian Arm. Over the long run, the technique also offers promise for enhancement in many fiord-like locations where space for rearing has always limited the potential for enhancement.

Throughout British Columbia, enhancement sites, like the counting fence and broodstock capture facility on Kanaka Creek, offer a valuable education resource for school children.

ISLAND PROJECT GOES THE BEAVER ONE BETTER

Although beaver dams cause problems for migrating salmon, the ponds behind them produce valuable habitat for juveniles. Last year, on Vancouver Island, SEP took a beaver "footprint" and improved on it to produce prime rearing habitat.

Wilfred Creek (known locally as Coal Creek) is one of many small streams along the east coast of Vancouver Island on which SEP has been working to rebuild wild coho populations. Here, a rearing channel was needed and the old beaver ponds provided the general outline for such a project, but improving on the beavers' haphazard pond-building was no easy feat.

"It was very challenging to construct – the most challenging I've ever been involved with," says SEP Engineering Technician Norm Hill, "But it worked out very well. We now have a series of riffled channels that link five ponds."

The area was already swampy – a legacy from the beaver dams that controlled hillside drainage. The small stream flow was broken into several channels before forming a brook that drained into Coal Creek.

It was an area with a lot of potential, so engineering skills were applied to develop that potential.

A controlled inlet from the river was created upstream, to ensure a constant supply of water. The ponds were sculptured to a depth of from 1.2 to 1.8 meters to provide areas of cool water for summer refuge. Then channels were constructed to link the ponds to each other and to Coal Creek. A series of dykes was constructed, to provide 60 cm of freeboard throughout the project.

Because MacMillan Bloedel had logged the land before construction started, the channels were designed to meander among the trees that were left standing. While the meandering design was more challenging for the construction crew, it provided all-important shade to the water. That, coupled with the depth of the ponds, will give

A living salmon, in all its spawning colours, provides a rare learning experience, especially when an expert is on hand to answer questions.

give young fish protection from the hot summer sun. The controlled inlet, with the system of dykes, will offer protection from winter floods – another problem that is common to streams in this area.

"Essentially, SEP took a naturally-occurring, ground-water fed series of beaver ponds and re-plumbed them to produce new habitat," says Dave Clough, who works as a consultant to the wild coho rebuilding program. "Our purpose was to increase the amount of wetted area in the summers and offer a sanctuary for winter rearing. This project will rear a lot of coho juveniles, as well as some cutthroat and steelhead."

"MAIN STREET" CHANNEL DRAWS FISH AND FANS

A waterway filled with spawning salmon is a sure-fire attention-getter and when a sockeye spawning channel is located right in the centre of town it draws many fans.

This was certainly the situation in the town of Horsefly in September 1989, when thousands of the green and scarlet fish swam into a channel right across from the town centre.

"A lot of people have never seen salmon spawn before, so this channel is ideal," says SEP project engineer Ed Woo. "People were there throughout the spawning season. This is one of our better sites; it has a high profile and is very accessible."

Of course, public awareness is not the only thing being served by the channel at Horsefly. Sockeye runs there are healthy in 1989 and 90 (and again in 1993 and 94) and SEP's plan is to build up the lower portion of these runs, using the new, 1700-metre channel.

It is not a new idea; the project had been looked at for many years. In 1988, SEP got the go-ahead. Land was acquired and cleared, then construction began. In all, it took about two years to finish the channel.

The cold winters in the Cariboo required that special attention be given to the channel's water intake to avoid winter freeze-up. An enormous, deep basin was excavated in front of the intake to keep the water flowing freely. This new sockeye channel got its first, and very serious, test during the intense cold spell in February, 1990. With constant monitoring by Quesnel hatchery staff, the channel ran perfectly.

The channel works. Now biologists have to wait patiently until August 1993 to see how many green and scarlet sockeye will make their appearance in downtown Horsefly as the first generation of "Main Street salmon."

PILOT FOR RECOVERY AT OWIKENO LAKE

During the spawning season, SEP facilities are an attraction for all ages. Kanaka Creek, near Maple Ridge, draws almost as many schoolchildren as fish and the Chilliwack River lures thousands of sport fishermen and women to its spectacular setting east of Vancouver.

Floods in 1989 damaged an essential element of the hatchery at Owikeno, taking out its water supply. Now a new pilot hatchery has been constructed at the site of two previously constructed groundwater wells. The project team, representing the Owikeno Band, SEP Community Programs and SEP Development Divisions, worked hard to get the pilot ready for fall, 1990.

SEP's primary objective for Rivers Inlet is to increase chinook production from the Wannock, Chuckwalla, Kilbella and Nookins rivers, but the first year of operation for the pilot was limited to chinook from the Wannock and Nookins. That allowed staff to get familiar with operation and maintenance of a facility that relies on diesel fuel for generating electricity and propane gas for heating incubation water. To reduce on-site rearing requirements, seapens are being used for final rearing.

Future plans include further exploration for more groundwater sources and construction of a larger, permanent hatchery in the area.

GETTING TOGETHER FOR THE PUNTLEDGE CHANNEL

For a long time, coho, chum and steelhead on the Puntledge River have been swimming into a trap. When water flows were high, a side channel offered good gravel for spawners and protection from the fast-flowing currents in the shale-bottomed river for juveniles. Inevitably, days or weeks later, fish that sought this tempting refuge were stranded as the water flow diminished and the channel shrank to a few scattered pools of water.

SEP-designed improvements to this side channel were proposed to correct the problem. It soon became a co-operative venture.

The channel is located just upstream of a B.C. Hydro powerhouse, so the utility's co-operation was sought. As a result, Hydro will be making funds available for some future work in the area. The road access and site are on property owned by Weldwood of Canada and the company's token-cost lease was an essential element. The local chapter of the Steelhead Society had a vested interest, and played a major role lobbying for the project and seeking funds. And, because of the steelhead population, the B.C. Ministry of Environment and Parks supplied about 75 percent of the project's $20,000 cost.

The new project accomplishes several things. The 300-metre long channel provides year-round flow through a river intake. It offers newly-dug side ponds where juveniles can take refuge even if extreme flooding does reach the channel. And it increases the productivity of the Puntledge – largely a bedrock-based waterway – by providing good spawning gravel.

"It's a good project," says SEP biologist Matt Foy. "The four groups that got behind it are interested in pursuing other co-operative work on the Puntledge."

The fall spawning season brings a rush of activity for people at SEP's major hatcheries, as broodstock is collected and eggs are taken to bolster the next generation of west coast salmonids.

BEATING THE DEADLINE AT ORFORD

The Orford River flows into Bute Inlet on the mainland, across from Campbell River. It had an excellent site for a spawning channel, with road access, a flat parcel of land adjacent to a gravity water supply and a run of summer chum that can be increased considerably. From a fisheries management viewpoint, additional production would be harvested as incidental catch in the Johnstone Strait fishery and, if necessary, by a terminal gillnet fishery in Bute Inlet.

The approval process, which is the most lengthy portion of a project schedule, was completed last year by the South Coast Area Planning Committee. The land was under map reserve and the water licence was issued. The project was scheduled originally over two years but, to take advantage of the large escapement expected, it was accelerated for completion in one.

To accomplish this, a lot of activity had to take place on the site immediately. Logging and land clearing began in winter 1990 and was completed in time for tendering of major earthwork contracts. Simultaneously, the detailed channel design drawings were underway. As well, the rip-rap preparation was commissioned and a fabricator was awarded a contract to build a metal box intake structure.

As the team attacked the one-year deadline, they faced the real challenge of the job – vast amounts of earth had to be moved. The excavation for the channel was an average of 3.7 metres deep. It was like moving a mountain – more than 100,000 square metres of earth – that's 10,000 truck loads!

Fortunately, with good weather and a great team effort, the project was completed, as requested, by August 1, 1990. The completed spawning channel has a spawning capacity of 22,000 chum and a production target of 100,000 adults. The infrastructure is now in place to rebuild this valuable run and hopefully provide a dependable fishery in the future, with Phase II expansion (to a spawning capacity of 300,000 adults) as a further option.

Staff at the Chilliwack hatchery strip milt from male salmon to fertilize batches of eggs for incubation. The scene is repeated at 15 other major hatcheries and at hundreds of contract and volunteer projects around B.C. each fall.

STUDY LOOKING AT NEW WAYS TO MARK FISH

To learn about the contribution of enhancement to the many West Coast fisheries, we must be able to identify various production groups. Since one coho or chinook looks very much the same as another, this has always been a problem, but new, high-technology methods may provide better, and more effective identification.

For many years, the only way to make a given group of fish stand out from their kin was to clip one or more of their fins. Unfortunately, the limited number of fins that can be clipped limits the number of groups you can mark within a given brood year.

Part of the problem was solved with the invention of the coded-wire tag. Injected into the nose cartilage and indicated by a clipped adipose fin, the tag is engraved with a code. This lets the tags carry a greater volume and variety of information than clipping alone – hence a large number of groups of fish can be identified.

Tagging has its limits, however; it is an expensive, labour-intensive operation. A batch of fry is anesthetized. Then each tiny, individual fish must be picked up, and have its adipose fin clipped and a tag inserted before the job is complete.

The method is not infallible, either. Some fish reject the tag. Untagged fish may lose the fin to a predator. Retrieval of these fish represents wasted labour. As well, many tagged fish never are retrieved; they are eaten by predators or are caught in the fisheries, but not detected.

What is really needed is an easy, fool-proof way to mark each and every fish in a given batch.

Since 1988, Bridget Ennevor, a graduate student in the Department of Animal Science at U.B.C., has been carrying out studies to provide that marking system. SEP, with the assistance of Pacific Salmon Treaty funds, is sponsoring her research project, which is taking place at the Capilano hatchery.

The method under investigation involves rare earth elements. These can be introduced into the water as the fry are rearing. The elements are taken up through the gills and deposited in the developing skeletons of the young fish. If the study proves that these elements remain in the fish, in detectable quantities, a mass-tagging method may finally be available.

"Rare earth elements were chosen because they are not naturally found in either fresh or salt water, so they cannot be introduced into fish by chance," says Ennevor, "other factors were their relatively low cost, safety, stability and detectability."

"If you are going to use a chemical mark," says Ken Pitre, of SEP's Bio-Program Unit, "you need something that will not also show up in the salmon's natural habitat. Because this is true of the rare earth elements, we can be

sure that they will be in the adult fish only if they have been deliberately introduced."

Science has identified a total of 15 rare earth elements, of which 14 are suitable for marking fish. Some of the elements, although potentially effective, are too costly – even for the relatively small amounts needed. Ennevor has identified several which are suitable and one of these, lanthanum, has been used in her research. It is relatively low in cost, easily obtained and can be detected reliability by the machinery available.

For salmonids in west cost waters, as for all of natures's treasures, the future depends on the young. As SEP projects, of all sizes, host thousands of schoolchildren each fall, the odds favouring a secure future for our salmonid populations increase.

"One of the best aspects of these elements, as marking agents, is that they are bone-seeking," says Ennevor, "When they are introduced into the water, they cross the gills and are carried in the bloodstream. Then they are laid down in the bones as they are forming.

"They are absorbed poorly, if at all, by the gastro-intestinal tract. For that reason, their presence in the water – and later in the fish – presents no danger to humans or other animals. Because they are contained in the bones, they have no ill effects on the treated fish and they can be located and detected in the mature animal."

It appears that using several of the suitable elements, in varying combinations and concentrations, could produce several hundred "codes" that fish would carry throughout their lives.

At present, some of the coho being used in this research are more than one year old. Up to that age, samples taken from them show no change in the amount of lanthanum in their bones. One group of the fish are now in salt water tanks at the West Vancouver Laboratory. If, when they are checked in their second year, this remains true, the rare earth marking system will have been proven effective.

ANNUAL PRODUCTION SUMMARY

Fish Production From SEP Facilities: 1989 Release Year

	SPECIES	JUVENILES RELEASED	EXPECTED ADULTS	CANADIAN CATCH
DEVELOPMENT DIVISION				
EMBLEY CREEK	PINK	14,137,500	212,063	127,238
	CHUM	63,000	441	203
	COHO	9,375	75	54
KAKWEIKAN FISHWAY				
	PINK	46,312,500	694,688	416,813
	CHUM	226,800	1,588	730
	COHO	2,250,000	18,000	13,055
	CHINOOK	62,500	125	80
NEKITE RIVER	CHUM	2,100,000	14,700	10,290
PHILLIPS CHAN.	PINK	9,000,000	135,000	81,000
	CHUM	168,000	1,176	541
LAKE ENRICHMENT PROGRAM (Total Lake Production)				
CHILKO LAKE	SOCKEYE	22,000,000	990,000	264,132
GREAT CENTRAL LAKE				
	SOCKEYE	7,124,665	320,610	195,572
HENDERSON LAKE	SOCKEYE	2,331,326	104,910	63,995
HOBITON LAKE	SOCKEYE	440,866	19,839	12,102
KENNEDY LAKE	SOCKEYE	1,093,284	49,198	30,011
LONG LAKE	SOCKEYE	2,972,795	133,776	73,577
NIMPKISH LAKE	SOCKEYE	3,055,849	137,513	77,007
WOSS LAKE	SOCKEYE	3,266,430	146,989	82,314
ENHANCEMENT OPERATIONS				
ADAMS RIVER UPPER	SOCKEYE	1,510,000	14,949	6,980
ATNARKO CHAN.	PINK	1,279,000	19,185	11,511
BIG QUALICUM RIVER	CHUM	65,958,551	461,710	300,112
	COHO	827,880	82,788	55,432
	CHINOOK	5,952,272	118,934	66,822
	CUTTHROAT	14,457	1,446	969
	STEELHEAD	68,887	1,361	681
BIRKENHEAD RIVER	CHINOOK	157,637	1,360	408
	STEELHEAD	8,091	81	49
CAPILANO RIVER	COHO	497,852	49,785	25,270
	CHINOOK	1,568,407	26,663	15,084
	STEELHEAD	80,353	1,240	620
CHEHALIS RIVER	CHUM	14,238,930	242,062	72,619
	COHO	1,044,570	94,791	66,808
	CHINOOK	446,927	4,903	4,029
	CUTTHROAT	22,082	2,208	1,479
	STEELHEAD	144,098	4,286	2,572
CHEMAINUS RIVER	COHO	26,727	267	179
	CHINOOK	296,546	5,931	3,332
CHILKO RIVER	SOCKEYE	4,896,000	48,470	12,932
CHILLIWACK RIVER	CHUM	2,599,102	44,185	19,883
	COHO	1,728,963	172,896	121,855
	CHINOOK	1,326,279	22,547	18,527
	STEELHEAD	171,593	5,478	3,287
CLEARWATER R UPR	CHINOOK	2,190,970	16,432	4,560
CONUMA RIVER	CHUM	12,501,582	212,527	127,516
	COHO	182,028	13,579	7,805
	CHINOOK	1,338,992	18,375	9,718
	STEELHEAD	11,243	112	101
EAGLE RIVER	COHO	906,050	23,833	16,274
	CHINOOK	809,046	6,884	2,065
FULTON RIVER	COHO	49,573	813	371
	SOCKEYE	164,840,000	1,631,916	610,337
GATES RIVER	SOCKEYE	11,937,986	118,186	29,640
GLENDALE CHAN.	PINK	19,462,689	291,940	175,164
	CHUM	4,802,805	33,620	15,465
INCH CREEK	CHUM	6,135,154	104,298	20,860
	COHO	272,675	26,728	18,838
	CHINOOK	164,620	2,806	694
	CUTTHROAT	40,615	4,062	2,722
KITIMAT RIVER	CHUM	6,750,396	114,757	34,083
	COHO	662,896	62,111	44,660
	CHINOOK	2,768,456	33,221	12,956
	CUTTHROAT	6,872	687	460
	STEELHEAD	64,728	2,188	1,094
LITTLE QUALICUM R	CHUM	37,499,428	262,496	170,622
	CHINOOK	4,034,712	80,694	45,337
	STEELHEAD	28,518	1,141	571
NADINA RIVER	SOCKEYE	8,300,000	82,170	21,923
NITINAT RIVER	CHUM	16,668,708	283,368	184,189
	CHINOOK	8,117,655	88,122	46,605
	STEELHEAD	1,352	8	7
PALLANT CREEK	CHUM	13,070,524	215,438	104,380
	COHO	448,451	15,548	6,953
	CHINOOK	127,638	1,404	505
PINKUT CREEK	SOCKEYE	44,014,000	435,739	162,966
PITT RIVER UPPER	SOCKEYE	4,492,872	41,346	11,031
PUNTLEDGE RIVER	PINK	3,286,590	49,299	29,579
	CHUM	3,230,689	38,768	25,199
	COHO	1,916,018	112,633	78,443
	CHINOOK	4,758,536	90,571	49,472
	STEELHEAD	110,254	3,127	1,564
QUESNEL RIVER	COHO	35,846	1,075	734
	CHINOOK	2,219,588	16,933	5,080
	STEELHEAD	24,054	144	86
QUINSAM RIVER	PINK	9,081,405	158,240	94,944
	COHO	1,471,981	114,058	78,574
	CHINOOK	3,843,347	76,867	39,259
	CUTTHROAT	7,084	708	474
	STEELHEAD	44,570	1,054	527
ROBERTSON CREEK	COHO	547,233	27,362	15,147
	CHINOOK	9,325,983	130,564	69,051
	STEELHEAD	187,373	6,278	5,605
SHUSWAP RIVER	CHINOOK	1,751,660	11,137	3,341
SNOOTLI CREEK	CHUM	7,779,641	131,721	97,803
	COHO	203,780	11,105	7,566
	CHINOOK	2,194,399	16,458	6,419
	CUTTHROAT	17,553	281	188
	STEELHEAD	114,548	863	432
SPIUS CREEK	COHO	440,380	16,786	10,741
	CHINOOK	1,141,410	9,122	2,737
	STEELHEAD	314,551	3,146	1,888
TENDERFOOT CREEK	COHO	175,862	17,586	8,926
	CHINOOK	1,343,245	22,835	15,087
	STEELHEAD	129,210	775	388
WEAVER CREEK	CHUM	579,715	4,058	1,741
	SOCKEYE	20,437,000	202,326	53,441
WHITEHORSE	CHINOOK	271,331	678	24
PROVINCE OF B.C.				
COBBLE QUARRY BCFW				
	CUTTHROAT	23,394	2,165	1,451
	STEELHEAD	244,702	5,660	2,830
COWICHAN LAKE BCFW				
	STEELHEAD	76,445	2,657	1,329
FRASER VALLEY BCFW				
	CUTTHROAT	89,855	6,593	4,417
	STEELHEAD	212,196	3,888	2,333
COMMUNITY ECONOMIC DEVELOPMENT PROGRAM				
ALOUETTE RIVER	CHUM	554,225	9,422	3,980
	COHO	112,842	8,994	5,755
	CUTTHROAT	37,629	3,763	2,521
	STEELHEAD	45,026	1,801	1,081
BAYNES SOUND	CHUM	676,500	4,736	2,084
	COHO	95,746	3,387	2,413

	SPECIES	JUVENILES RELEASED	EXPECTED ADULTS	CANADIAN CATCH
BELLA BELLA	CHUM	1,284,478	24,405	16,913
	COHO	113,015	9,872	6,982
CHEHALIS R	CHUM	3,582,500	25,078	10,593
CLAYOQUOT	COHO	19,000	380	226
	CHINOOK	198,000	2,103	999
COWICHAN RIVER	COHO	233,264	4,398	3,134
	CHINOOK	855,282	15,791	8,843
FORT BABINE	COHO	194,503	17,214	7,855
	CHINOOK	142,864	1,767	733
FORT ST JAMES	CHINOOK	65,359	490	147
HARTLEY BAY CREEK	COHO	29,270	2,927	2,070
KINCOLITH	CHINOOK	52,306	1,046	310
KISPIOX RIVER	COHO	31,177	3,118	1,423
	CHINOOK	135,847	2,031	842
KITSUMKALUM RIVER	CHUM	165,657	2,816	1,890
	COHO	81,727	5,249	2,395
KLEMTU	CHUM	139,123	2,643	1,832
	COHO	44,268	4,427	3,131
MASSET	COHO	22,380	2,238	996
	CHINOOK	199,000	2,189	788
NANAIMO RIVER	COHO	250,635	5,747	4,095
	CHINOOK	660,120	13,202	7,393
NIMPKISH	CHUM	1,103,316	18,756	8,628
	COHO	11,730	117	85
	SOCKEYE	481,584	4,334	2,427
	CHINOOK	77,360	1,547	985
OWIKENO	CHINOOK	269,711	3,237	1,474
P.HARDY/QUATSE	PINK	2,393,232	35,898	21,539
	CHUM	93,201	1,118	514
	COHO	33,203	664	482
	CHINOOK	5,150	39	25
	STEELHEAD	42,134	1,220	610
P.HARDY/STEPHENS	CHUM	102,336	803	353
	COHO	121,662	1,973	1,218
	CHINOOK	49,990	700	333
PENNY CDP	CHINOOK	139,958	1,041	312
POWELL RIVER	CHUM	170,776	2,903	1,277
	COHO	234,898	13,982	7,073
	CHINOOK	122,577	2,084	1,460
SAN JUAN RIVER	CHUM	43,500	305	134
	COHO	532,205	8,469	5,037
	CHINOOK	678,464	8,848	4,205
SECHELT	CHUM	131,495	2,235	983
	COHO	92,629	9,263	4,686
	CHINOOK	85,403	1,452	1,017
SEYMOUR R	CHUM	90,439	1,085	477
	COHO	119,477	6,657	3,367
	CHINOOK	100,741	756	530
	STEELHEAD	15,509	506	253
SKIDEGATE	CHUM	136,900	2,327	992
	COHO	29,411	882	393
SLIAMMON RIVER	CHUM	580,000	9,860	4,338
	COHO	44,756	1,343	679
TERRACE	COHO	77,806	6,225	2,840
	CHINOOK	366,219	4,325	1,794
THOMPSON RIVER NORTH				
	COHO	222,323	7,095	4,540
THORNTON CREEK	COHO	289,912	7,792	4,634
	CHINOOK	319,627	4,475	2,127
TOBOGGAN CR	COHO	93,368	9,337	4,260
	CHINOOK	114,095	2,282	947
VANCOUVER BAY	CHUM	24,450	416	183
	COHO	13,867	1,387	702
	CHINOOK	395,520	3,369	2,360
	STEELHEAD	24,574	246	123

	SPECIES	JUVENILES RELEASED	EXPECTED ADULTS	CANADIAN CATCH
PUBLIC INVOLVEMENT PROGRAM				
CENTRAL COAST	COHO	59,754	681	481
GEORGIA STRAIT MAINLAND				
	CHUM	985,338	8,902	3,916
	COHO	311,359	12,966	6,560
	SOCKEYE	32,732	295	207
	CHINOOK	249,677	4,245	2,973
	CUTTHROAT	12,779	1,144	767
	STEELHEAD	46,988	800	400
GEORGIA STRAIT VANCOUVER ISLAND				
	PINK	1,475,000	22,725	13,635
	CHUM	66,670	585	258
	COHO	685,454	10,055	7,165
	CHINOOK	726,936	12,269	6,870
	CUTTHROAT	6,500	650	436
JOHNSTONE STRAIT	PINK	95,245	1,429	858
	CHUM	12,700	189	87
	COHO	612,900	6,018	4,365
	CHINOOK	205,000	4,100	2,611
	STEELHEAD	21,709	217	110
LOWER FRASER RIVER				
	CHUM	491,875	6,031	2,546
	COHO	203,170	10,254	6,560
	CUTTHROAT	11,938	1,194	800
	STEELHEAD	28,380	755	453
NASS RIVER	COHO	106,420	3,768	564
	CHINOOK	48,000	528	15
NORTH WEST VANCOUVER ISLAND				
	CHUM	74,840	1,164	512
	COHO	104,002	2,460	1,519
	CHINOOK	731,848	6,469	3,074
	STEELHEAD	9,000	90	81
QUEEN CHARLOTTE ISLANDS				
	CHUM	168,000	2,856	1,217
	COHO	277,204	5,666	2,521
RIVERS/SMITH INLETS				
	CHINOOK	242,900	1,822	830
SKEENA RIVER	CHUM	38,000	266	178
	COHO	48,929	1,581	723
SOUTH WEST VANCOUVER ISLAND				
	COHO	498,000	8,110	4,823
	CHINOOK	320,700	3,315	1,575
THOMPSON RIVER	COHO	29,571	340	218
	CHINOOK	173,480	353	105
UPPER FRASER RIVER	COHO	80	2	1
	CHINOOK	79,871	598	180
RESOURCE RESTORATION UNIT				
ANDESIDE CHAN.	COHO	1,050	158	72
B.C.RAIL.CHAN.	CHUM	1,000,000	14,000	6,160
	COHO	3,000	450	228
BAYNES SOUND STR.	CHUM	676,500	4,736	2,084
	COHO	95,746	3,387	2,413
BILLY HARRIS SLOUGH				
	CHUM	1,500,000	21,000	8,871
	COHO	5,000	750	480
BONSALL SLOUGH	CHUM	500,000	7,000	3,080
	COHO	4,600	690	492
CHILQUA CREEK	CHUM	500,000	7,000	2,957
	COHO	1,200	180	115
DEADMAN CHAN.	COHO	1,200	180	115
DUDLEY MARSH	COHO	47,211	472	336
ED LEON SLOUGH	PINK	75,000	1,875	925
	CHUM	1,500,000	21,000	8,871
	COHO	5,000	750	480

	SPECIES	JUVENILES RELEASED	EXPECTED ADULTS	CANADIAN CATCH
ENGLISHMAN RIVER	CHUM	1,144,000	8,008	3,524
	COHO	27,100	271	193
	CHINOOK	181,063	2,487	1,393
HICKS CREEK POND	CHUM	25,000	350	148
	COHO	4,000	600	384
HOPEDALE CHAN.	CHUM	1,200,000	16,800	7,096
	COHO	7,800	1,170	749
HOPEDALE SLOUGH	CHUM	150,000	2,100	887
	COHO	4,000	600	384
JACK SLOUGH	CHUM	1,000,000	14,000	6,160
JUDD SLOUGH	CHUM	1,500,000	21,000	9,240
	COHO	7,800	1,170	592
KITSUMKALUM LAKE	SOCKEYE	250,000	2,475	926
KITWANCOOL CHAN.	COHO	200	30	14
LANG CHAN.	PINK	375,000	5,625	4,163
	CHUM	650,000	9,100	4,004
	COHO	2,500	375	190
MAMQUAM RIVER	PINK	600,000	9,000	6,660
	CHUM	1,500,000	21,000	9,240
	COHO	4,500	675	341
MASHITER CHAN.	CHUM	420,000	5,880	2,587
	COHO	5,000	750	379
MCNAB CHAN.	CHUM	11,200	157	69
	COHO	1,500	225	114
MOODIE'S CHAN.	CHUM	500,000	7,000	3,080
	COHO	9,900	1,485	751
NANOOSE CREEK	COHO	22,988	230	164
PARADISE CHAN. LOWER				
	CHUM	500,000	7,000	3,080
	COHO	4,500	675	341
PARADISE CHAN. UPPER				
	CHUM	500,000	7,000	3,080
	COHO	7,800	1,170	592
PEACH CREEK	CHUM	1,500,000	21,000	8,871
	COHO	13,500	2,025	1,296
PRETTYS CHAN.	CHUM	100,000	1,400	591
RAILROAD CREEK	CHUM	350,000	4,900	2,070
	COHO	250	38	24
ROTARY PARK	CHUM	500,000	7,000	3,080
	COHO	4,000	600	428
RYDER CREEK	CHUM	150,000	2,100	887
SEABIRD CHAN.	CHUM	18,900	265	112
	COHO	3,000	450	288
	SOCKEYE	14,100	140	37
SMOKEHOUSE CHAN.	CHUM	685,000	9,590	4,051
	COHO	2,055	308	197
VAN.BAY CHAN.	CHUM	170,000	2,380	1,047
	COHO	500	75	38
WELDWOOD CHAN.	CHUM	400,000	5,600	2,464
	COHO	1,350	203	103
WESTHOLME CHAN.	CHUM	1,000,000	14,000	6,160
	COHO	1,300	195	139
WORTH CREEK	CHUM	350,000	4,900	2,070
	COHO	8,000	1,200	768

PROGRAMS AREAS

	SPECIES	JUVENILES RELEASED	EXPECTED ADULTS	CANADIAN CATCH
COMMUNITY ECONOMIC DEVELOPMENT				
	PINK	2,393,232	35,898	21,539
	CHUM	8,202,396	104,172	53,087
	COHO	3,049,328	139,750	78,058
	SOCKEYE	481,584	4,334	2,427
	CHINOOK	5,033,593	72,774	37,624
	CUTTHROAT	37,629	3,763	2,521
	STEELHEAD	127,243	3,773	2,067
PUBLIC INVOLVEMENT PROGRAM				
	PINK	1,570,245	24,154	14,493
	CHUM	1,837,423	19,993	8,714
	COHO	2,936,843	61,901	35,500
	SOCKEYE	32,732	295	207
	CHINOOK	2,778,412	33,699	18,233
	CUTTHROAT	31,217	2,988	2,003
	STEELHEAD	106,077	1,862	1,044
RESOURCE RESTORATION UNIT				
	PINK	1,050,000	16,500	11,748
	CHUM	25,703,400	347,105	150,673
	COHO	306,050	21,312	13,086
	SOCKEYE	264,100	2,615	963
	CHINOOK	181,063	2,487	1,393
DEVELOPMENT DIVISION				
	PINK	69,450,000	1,041,751	625,051
	CHUM	2,557,800	17,905	11,764
	COHO	2,259,375	18,075	13,109
	CHINOOK	62,500	125	80
LAKE ENRICHMENT PROGRAM (Total Lake Production)				
	SOCKEYE	42,285,215	1,902,835	798,710
ENHANCEMENT OPERATIONS				
	PINK	33,109,684	518,664	311,198
	CHUM	191,815,225	2,149,008	1,174,444
	COHO	11,438,765	843,744	564,576
	SOCKEYE	260,427,858	2,575,102	909,250
	CHINOOK	56,149,656	825,589	429,750
	CUTTHROAT	108,663	9,392	6,292
	STEELHEAD	1,503,423	31,282	19,472
PROVINCE OF B.C.	CUTTHROAT	113,249	8,758	5,868
	STEELHEAD	533,343	12,205	6,492

SPECIES PRODUCTION SUMMARY

SPECIES	JUVENILES RELEASED	EXPECTED ADULTS	CANADIAN CATCH
PINK	107,573,161	1,636,967	984,029
CHUM	230,116,244	2,638,183	1,398,682
COHO	19,990,361	1,084,782	704,329
SOCKEYE	303,491,489	4,485,181	1,711,557
CHINOOK	64,205,224	934,674	487,080
CUTTHROAT	290,758	24,901	16,684
STEELHEAD	2,270,086	49,122	29,075